WILD BIRDS, DOMESTIC BIRDS & AVIAN INFLUENZA: A PERFECT STORM?

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DECEMBER 11, 2015
BACKGROUND
QUICK INTRO TO AVIAN INFLUENZA VIRUSES

8 gene segments:
- Hemagglutinin gene
  - 18 different H-types have been identified
- Neuraminidase gene
  - 11 different N-types have been identified

2 lineages:
- North American
- Eurasian

Pathogenicity
- Low-pathogenicity (LPAI)
- High-pathogenicity (HPAI)
  - To date just H5 and H7
WHY THE INTEREST IN WILD BIRDS?

**Reservoirs**
Natural reservoirs of low-pathogenicity strains:
- Waterfowl (ducks, geese, swans)
- Shorebirds (waders and gulls)

**Movers**
- LPAI - Wild bird migrations play a role
- HPAI – Conflicting information

**Spread between wild birds**
- Water (fecal-oral)
- Predation
- Incidental
BIRDS MOVE ALL OVER

Over 75% of Canadian bird species spend at least half the year outside of Canada

birding.about.com

http://www.ducks.org/hunting/bandreturn/ON
HIGHLY PATHOGENIC AVIAN INFLUENZA - 2014/2015
US

• Poultry
  - 48,091,293 birds affected
  - 223 farms
  - Last detection 6/17/15

• Captive wild birds
  - 5 birds affected

• Wild birds
  - 84 birds detected
  - Last detection 6/10/15

Canada

• Poultry
  - 245,600 birds affected in BC; 79,700 in ON
  - 11 farms in BC; 3 farms in ON

• Wild birds
  - 1 bird detected
  - Last detection Fall 2014
ONGOING SPREAD & EVOLUTION OF H5

Pre 2014

HPAI H5N8

Clade 2.3.4.4
HPAI H5N8

Group A

2014

icA1

icA2

icA3

HPAI H5N8, H5N2, H5N1
ONGOING SPREAD & EVOLUTION OF H5

Clade 2.3.4.4
HPAI H5N8

HPAI H5N8, H5N2, H5N1

icA1, icA2 and icA3 all seen in Japan in winter 2014/15

Pre 2014

2014
Healthy waterfowl, some dead geese, commercial and backyard poultry; Western US

BC and Ontario poultry; multiple US states affected; waterfowl and raptors; Central US

Backyard birds in BC; duck in Washington

In BC and down US Pacific Coast; dead raptors, healthy waterfowl
HPAI H5N8 IN NORTH AMERICA 2014-2015

December 2014:
- Wild birds
- Captive falcons
- Backyard poultry
January – February 2015:
- Wild birds
- Captive falcons
- Commercial poultry
HPAI H5N8 IN NORTH AMERICA 2014-2015

May 2015:
- Backyard poultry
December 2014:
- Wild birds
- Backyard poultry
- Commercial poultry
January – February 2015:
- Wild birds
- Captive falcons/owl
- Backyard poultry
- Commercial poultry
HPAI H5N2 IN NORTH AMERICA 2014-2015

March – April 2015:
- Wild birds
- Captive falcons
- Backyard poultry
- Commercial poultry
May 2015:
- Backyard poultry
- Commercial poultry

H5N1:
- Backyard poultry (February 2015)
- Wild birds (December 2014-January 2015)
BIRDS, VIRUSES, ENVIRONMENT AND CLIMATE
WILD BIRDS AND VIRUSES

Reservoirs
Natural reservoirs of low-pathogenicity strains:
  - Waterfowl (ducks, geese, swans)
  - Shorebirds (waders and gulls)

Transmission and spread
  - Water
    - Enables fecal-oral transmission
    - Virus survival
    - Redistributes the circulating viruses
Fig. 1. Distribution of Anatidae breeding and wintering areas
Source: Adapted from del Hoyo, Elliott and Sargatal (9)
DOES CLIMATE AFFECT MIGRATORY WATERFOWL?

YES!

- Northward shift in distributions
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- Northward shift in distributions
- Change in species composition at northern latitudes
- Reduced number of species undertaking long-distance migration
- Earlier spring migration
- Possible effects on timing of fall migration
- More extreme weather events – abnormal movement
DOES CLIMATE AFFECT MIGRATORY WATERFOWL?

YES!

- Indirect effects on:
  - Sea levels
  - Fires
  - Vegetation
  - Land use

And all of these can result in loss of habitat and reduction of available food sources.
DOES CLIMATE AFFECT AIV?

Because it will affect the reservoir, climate will affect LPAI
BUT HOW?

- Ability to survive outside the host
- Transmission and spread between hosts

Less clear if or how climate will affect HPAI
WHY?

- The role of wild birds in circulation and spread of HPAI is less clear
- HPAI viruses have been circulating worldwide in many different climates
STILL MANY UNANSWERED QUESTIONS

Movement and transmission:
   - Big distances:
     - Migratory bird movements
     - Trade
       • Poultry and poultry products
       • Wild birds
   - Little distances:
     - ??
       • Exposure pathways connecting wild birds and poultry
       • Pathogen movement at wildlife-poultry interface
AIV SURVEILLANCE RESULTS - 2015
## CANADA’S INTER-AGENCY WILD BIRD INFLUENZA SURVEY

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<th>Year</th>
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<th>Live</th>
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CANADA’S INTER-AGENCY WILD BIRD INFLUENZA SURVEY

To date in 2015:

- 2009 **dead** birds have been tested (<2% positive; n=29)
  - 324 from Ontario (2 positive – not H5 or H7)
- 2999 **live** birds have been tested (16% positive; n=494)
  - 1681 from Ontario (27% positive; n=455)
- 1 hunter killed duck from BC tested positive for HPAI H5N8 in February; all other detections have been of low pathogenicity
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